

of balls in single file, the sloping faces all showing the spheres in triangular order.

Suppose a bag, impermeable to water, is filled with lead shot, placed in an hydraulic press, and subjected to great pressure. The lead spheres will be flattened against each other in regular cell structure into a solid mass, each sphere being changed into a rhombic dodecahedron; and in this manner the form of the cell of the bee has been considered as arising in a natural manner by Mrs. Bryant, D.Sc., in a paper read before the London Mathematical Society, vol. xvi., "On the Ideal Geometrical Form of Natural Cell-Structure." The plane surfaces of separation also form a possible arrangement of the films of a mass of soap-bubbles; but the instability of the corners where six edges meet modifies the soap bubble arrangement to the form investigated by Sir W. Thomson in the *Acta Mathematica*.

April 27.

A. G. GREENHILL.

Name for Unit of Self-Induction.

A NAME for the unit coefficient of self-induction is much wanted. No one is satisfied with seohm, and yet it seems making its way; by reason, no doubt, of Ayrton and Perry's ingenious commutating arrangement for helping to measure it. It is an unpleasing name, and it is too big a unit. The name quad, which I formerly suggested, is on further consideration still less satisfactory for permanent use, because it emphasizes unduly the accident that in electro-magnetic measure self-induction happens to be a length. One looks forward to the time when all distinction between electrostatic and electro-magnetic measures shall vanish by both ceasing to be; and at that not far-distant time, names emphasizing the present arbitrary state of things will be anachronisms, as well as stumbling-blocks to beginners. I beg to suggest that a milli-seohm shall be called a *vo*. It is a short and harmless unmeaning syllable not yet appropriated. It should be its own plural. The unit of conductivity is already styled a *mo*; and 8 *vo* will look well alongside 12 *mo*. "Vometer" is short and satisfactory. A unit of magnetic induction will then be the *vo*-ampere; and this, being of a size convenient for dynamo makers, may be hoped to replace their abominable mongrel unit "Kapp-lines."

The *vo* in electro-magnetic measure is 10 kilometres, and hence a *vo* ampere per square decimetre is a magnetic field of a thousand C.G.S. units, and might be called a "Gauss." For lightning-conductor work the natural unit of self-induction will be a milli-*vo*, or 10 metres of electro-magnetic measure.

Grasmere, April 16.

OLIVER J. LODGE.

Hertz's Equations.

PERMIT me to add a line of explanation of my letter on this subject, printed in NATURE, vol. xxxix, p. 558. I intended no criticism of Hertz's general result, but merely to draw attention to the necessity of rejecting all solutions of the equation in Π which made the force (Z) infinite for points on the vibrator.

Berkswell, April 24.

H. W. WATSON.

A NEW PEST OF FARM CROPS.

DURING the past three or four years, in the examination of plants affected by various injurious worms and Arthropods, and of the soils in which such plants grew, I have from time to time been led to suspect that certain small species of *Oligochæta* were concerned in damaging, if not ultimately destroying, several species of cultivated plants. With a view to converting suspicion into proof, experiments on isolated growing pot-plants have been carried on.

Within the past few weeks I have received, through the kindness of Miss E. A. Ormerod, additional evidence of a striking character, which induces me to place the main facts on record.

In the spring of 1885, Miss Ormerod forwarded to me for inspection two small white *Oligochæta*, $1\frac{1}{2}$ inch long, received by her in soils from the roots of plants. In reporting on them I replied that it did not seem very probable that they could seriously injure the plants.

In April 1888, an inquiry reached me as to the nature and means of prevention of a serious attack of "small white worms" destructive to pot and green-house plants. On being placed in communication with the observer, the Rev. William Lockett, Rector of Littledean, I received from him a box of soil taken from his affected flower-pots, and much valuable information in answer to a series of questions put by me. The soil itself contained some hundreds of the white worms described; and the detailed information all pointed to these worms as the cause of many serious losses which had been sustained.

The worms were Enchytræidæ, of the genus *Enchytraeus*, apparently near to *E. Buchholzii*, Vejd. I took three plants, a sunflower, a geranium, and a tradescantia, and had them re-potted in carefully examined sifted earth; when they were well established, I put fifteen of the worms into each pot, and left them to be tended by the gardener. I kept a number of the worms in soil which was alternately wetted and dried at regular intervals. They all kept alive and vigorous; when wet to complete immersion they were most active, when dried they remained quiescent, apparently dried up, and difficult to discover.

After two months, the sunflower drooped and bent over, and examination showed the roots and rootlets dead and the stem rotting. Within the decaying stem some of the Enchytræidæ were found alive and active. The other two plants are still living, but it will be shown that the number of worms supplied them was too small. Mr. Lockett lost spiræas, vegetable marrows, fuchsias, gloxinias, and many other plants, and the dead roots often contained in and around them many hundreds of worms to each plant. Both in his garden and a neighbouring ash-heap he found an abundance of them.

I was on the point of repeating my experiments this spring with various seedlings, when I received by the kindness of Dr. Gilbert, of Rothamsted (at the suggestion of Miss Ormerod), a quill with two or three specimens of worms of the same genus. Mr. John J. Willis, the superintendent of the field experiments at Rothamsted, in sending them described them as obtained from a field of clover "with a good plant except across one portion of the field, where all the plants were dying off," the small worms occurring at the roots of the clover along with larvæ of *Sitones* and wire-worm. "There is scarcely a plant that has not one or more of these creatures attached." Mr. Willis has been good enough to send me several communications on the subject, and a supply of the worms, living and in spirit. Much of his information is interesting, as that the more decayed the root, the larger the number of worms; that even healthy plants harbour a few specimens; that the worms seem sometimes to enwrap the rootlets with their coiled body. He hears of other fields of clover in a similar condition apparently to those at Rothamsted. I have a quantity of detailed information, but to summarize it, there appears to be but little room for doubt that these small *Oligochæta* are one cause of the decay of the clover at Rothamsted, as they were of the many varieties of garden plants at Littledean.

The Enchytræidæ have not hitherto, so far as I can learn, been accused of causing serious injury to plants. Vejdovsky, in his "Monographie der Enchytræiden," says, "Die Enchytræiden bewohnen trockene und feuchte Erde, süßes und salziges Wasser, Sümpfe und morsches Holz." In what manner they directly injure the plant remains to be observed—probably by sucking the fine root-hairs. Under observation the pharynx is rapidly everted and withdrawn in the act of feeding. I have so far recognized two species. If, as seems not improbable, further corroboration should be forthcoming, we may find that we have to add to the list of enemies of the clover plant from which it so mysteriously suffers, these unsuspected *Oligochætes*. The discovery, though fraught

with so little satisfaction to the already burdened agriculturist, can hardly fail to prove of interest to the zoological student of farm pests.

ALLEN HARKER.

Royal Agricultural College, Cirencester, April 10.

RAIN CLOUDS ON LAKE TITICACA.

THE cloud system here, 12,500 feet above sea-level, is so beautiful, and seems to throw so much light on the formation of one particular type of shower, that I venture to send diagrammatic sketches of two excellent specimens of cloud-building over rain.

I have never seen cumuloform clouds so perfectly developed as on this lake. Whether the height above the dust and haze of lower levels makes the blue sky darker than usual, or whether the temperature is such that the cumulus is composed of snow-flakes instead of water-drops, the contrast between the sky and cloud is much greater than usual.

The sketches were taken on a showery day, and the clouds were visible simultaneously in different directions. The type of shower is not unknown at home, but there much complication arises from the almost constant existence of cyclonic cloud systems.

Certain features are common to both pictures. Nearest the earth, appears a more or less conical-shaped space *r*,

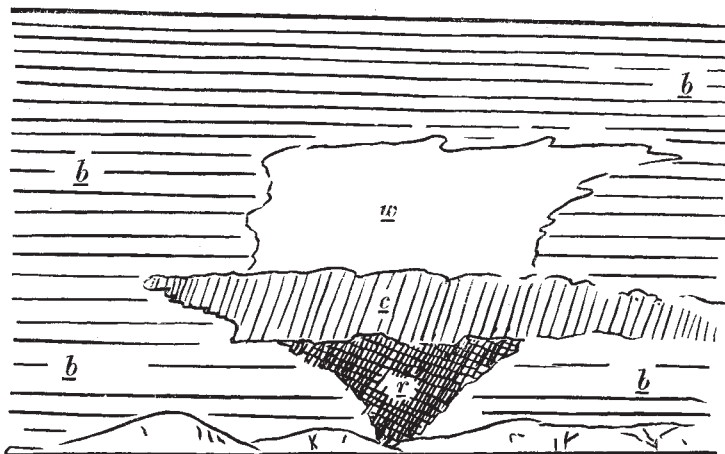


FIG. 1.—*b*, blue sky; *c*, flat-topped mass of dark cloud, rounded components; *r*, rain; *w*, white cloud, tending to flatter out and to cirrify.



FIG. 2.—*b*, blue sky; *c*, dark cumuloform cloud, flat-topped at edges; *d*, dark belt; *r*, rain; *w*, white cloud, tending to flatten and to cirrify.

of uniform inky blackness, where rain is falling. Above, and stretching laterally some distance beyond the rain, is a belt of dark cloud, *c*, curiously flattened at the top; but the outlines are always *rounded*, and there is no trace of linear or hairy structure. In Fig. 2 a mountainous rocky cumulus rises above the flat dark mass *c*; and as the rain could be seen falling, I have indicated that appearance in the sketch.

In both, a white cloud, *w*, of remarkable shape and structure, rises above the dark mass *c*. Sometimes, as in Fig. 1, this cloud is nearly uniform in structure, but exhibits a tendency towards hairy structure at the edges. Other times, as in Fig. 2, the white cloud *w* shows traces of

cumuloform structure of a very peculiar type. Instead of round, rocky lumps, the white cloud is composed of long, straight, fingery masses of cumulus, with a tendency to fibrous or hairy structure, and radiating slightly outwards from the base, like the head of a cauliflower. I have endeavoured to suggest this appearance by the straight lines, drawn through *w*, in Fig. 2; for the real structure defies delineation with pen or pencil.

In all cases, the top of *w* is more or less flat, and the whole diffuses outwards, sideways, or edgeways, rather than upwards. As the shower breaks up, *w* seems to be left as a middle-level layer of strato-cirrus.

The whole shower is surrounded by blue sky, there is